

A NEW DISTRIBUTIONAL RECORD FOR THE
SAND-BURROWING MAYFLY
DOLANIA AMERICANA
(EPHEMEROPTERA: BEHNINGIIDAE)¹

William L. Jacobs²

ABSTRACT: The sand-burrowing mayfly, *Dolania americana* is reported for the first time from the St. Croix River at the Wisconsin/Minnesota border. This record extends the range of this unique species far northward from its known typical southeastern blackwater habitats. A possible dispersal route for this species from the southeastern Coastal Plain into the St. Croix River system is briefly discussed.

The only North American member of the sand-burrowing mayfly family Behningiidae, *Dolania americana* Edmunds and Traver has been previously reported from Alabama (Wester and Folkerts 1987), Florida (Schneider 1966), Georgia (Benke *et al.* 1984), Louisiana (Dakin and Felder 1981), North Carolina (Finn and Herlong 1980), and South Carolina (Edmunds and Traver 1959, Harvey *et al.* 1980). The biology of this mayfly is relatively well-known. Its preferred habitat is clean, shifting sand rivers and large streams (Peters and Peters 1977, Tsui and Hubbard 1979, Fink 1986, and Peters *et al.* 1987).

On July 24, 1989, one nymph was collected from the St. Croix River. The collection site was near Soderbeck Landing, St. Croix National Scenic Riverway (Burnett County, Wisconsin). This site was approximately 70m upstream from the confluence of the Snake River, which originates in Minnesota. This nymph was collected with a Surber square foot sampler at a depth of 70-85cm. Due to drought conditions, the river was unseasonably low. The primary substrate consisted of fine grain sand (0.0625-0.125mm size range) and water pH was 7.4. Another specimen was collected August 21, 1989 at the same site. The two nymphs measured 5mm and 7mm body length respectively, indicating a 2 year life cycle.

Previous macroinvertebrate studies of the St. Croix National Scenic Riverway have yielded no *Dolania*. Additionally, no nymphs were collected during studies of a major Wisconsin tributary, the Namekagon River. The current benthic macroinvertebrate study of the St. Croix River involved collections every two weeks from late May until the end of September. Samples were taken upstream and downstream of the following tributaries: Cranberry bog (a bog which flows into the

¹Received February 7, 1990. Accepted March 27, 1990.

²Colorado State University, Department of Entomology, Fort Collins, Colorado 80523

Namekagon River just below Pacawong Dam, Sawyer County, Wisconsin), Yellow River, Clam River (Burnett County, Wisconsin), Kettle River, Snake River (Pine County, Minnesota), Sunrise River (Chisago County, Minnesota), and Apple River (St. Croix County, Wisconsin). It is interesting to note that *Dolania* has not been previously reported from Wisconsin, although many streams have been intensively surveyed by William L. Hilsenhoff and co-workers (for example Hilsenhoff 1977).

Other mayflies collected with the *Dolania* specimens include *Baetis* spp. (Baetidae); *Isonychia* sp. (Oligoneuriidae); *Leucrocuta hebe* (McDunnough), *Stenacron interpunctatum* (Say), *Stenonema* spp., *Rhithrogena pellucida* Daggy, *Epeorus vitreus* (Walker) (Heptageniidae); *Choroterpes basalis* (Banks)?, *Leptophlebia cupida* (Say), *Paraleptophlebia* sp. (Leptophlebiidae); *Potamanthus* sp. (Potamanthidae); *Ephemerula simulans* Walker, *Hexagenia limbata* (Serville) (Ephemeridae); *Ephoron leukon* Williamson (Polymitarcyidae); *Serratella* spp., *Ephemerella* spp., *Eurylophella* spp., *Attenella attenuata* (McDunnough) (Ephemerellidae); *Tricorythodes* sp. (Tricorythidae); *Caenis* spp., *Brachycercus* sp. (Caenidae), *Baetisca obesa* (Say) and *B. lacustris* McDunnough (Baetiscidae).

All of Minnesota and much of Wisconsin were covered with glacier during the last glacial stage, the Wisconsinan (Flint 1971), indicating post-glacial migration by the present day Ephemeroptera. This last glacial stage began retreating about $12-15 \times 10^3$ B.P. Aquatic dispersal by nymphs opposed to aerial dispersal by adults appears to be the likely mechanism in *Dolania*. The duration of the adult stage is less than two hours (Peters and Peters 1977). Flannagan and Flannagan (1984) outline post-glacial waterways from glacial Lake Agassiz (centered in Manitoba) and present likely migration routes. *Dolania* probably would be included in the South Agassiz group, inhabitants of the Gulf of Mexico watershed. Migration northward likely occurred through the Mississippi-Missouri River system when Lake Agassiz drained southwards. Contemporary watershed barriers probably prevented recent northward migration of *Dolania* and other mayflies from the southeastern Coastal Plain, indicating that *Dolania* has probably been present in the St. Croix River system before recent times.

ACKNOWLEDGMENTS

I thank William L. Peters, Florida A & M University for verifying the identification of *Dolania*, and Boris C. Kondratieff, Terence P. Boyle and Mitch A. Harris, Colorado State University, for prepublication reviews. William L. Hilsenhoff, University of Wisconsin and William L. Peters provided valuable comments which also improved the manuscript. This study is part of the National Park Service supported research on resource inventory of St. Croix National Scenic Riverway.

LITERATURE CITED

- Benke, A.C., T.C. Van Arsdall, Jr., D.M. Gillespie, and F.K. Parrish. 1984. Invertebrate productivity in a subtropical blackwater river: the importance of habitat and life history. *Ecol. Monogr.* 54: 25-63.
- Dakin, M.E., Jr. and Felder. 1981. A record of the mayfly *Dolania americana* in Louisiana (Ephemeroptera: Behningiidae). *Florida Entomol.* 74: 454-455.
- Edmunds, G.F. and J.R. Traver. 1959. The Classification of the Ephemeroptera I. Ephemeroidea: Behningiidae. *Ann. Entomol. Soc. Amer.* 52: 43-51.
- Fink, T.J. 1986. The reproductive life history of the predaceous, sand-burrowing mayfly *Dolania americana* (Ephemeroptera: Behningiidae). PhD dissertation. Florida St. Univ., Tallahassee.
- Finn, P.L. and D.D. Herlong. 1980. New distributional record of *Dolania americana* (Ephemeroptera: Behningiidae). *Entomol. News* 91: 102-104.
- Flannagan, P.M. and J.F. Flannagan. 1984. The post-glacial origin and present distribution of the mayflies (Ephemeroptera) of Manitoba, Canada. Pp. 149-169. In Landa, V., T. Soldan, and M. Tonner (eds.). *Proc. IVth Intern. Conf. Ephemeroptera.* Czechoslovak Acad. Sci.
- Flint, R.F. 1971. *Glacial and quaternary geology.* J. Wiley and Sons, Inc., NY. 892 pp.
- Harvey, R.S., R.L. Vannote, and B.W. Sweeney. 1980. Life history, developmental processes, and energetics of the burrowing mayfly *Dolania americana*. Pp. 211-230. In Flannagan, J.F. and K.E. Marshall (eds). *Advances in Ephemeroptera Biology.* Plenum Press, New York.
- Hilsenhoff, W.L. 1977. Use of arthropods to evaluate water quality of streams. Wisconsin Dept. Nat. Res. Tech. Bull. 100: 1-15.
- Peters, J.G., W.L. Peters, and T.J. Fink. 1987. Seasonal synchronization of emergence in *Dolania americana* (Ephemeroptera: Behningiidae). *Can. J. Zool.* 65: 3177-3185.
- Peters, W.L. and J.G. Peters. 1977. Adult life and emergence of *Dolania americana* in northwestern Florida (Ephemeroptera: Behningiidae). *Int. Rev. Ges. Hydrobiol.* 62: 409-438.
- Schneider, R.F. 1966. Mayfly nymphs from northwestern Florida. *Quart. J. Florida Acad. Sci.* 29: 203-206.
- Tsui, P.T.P. and M.D. Hubbard. 1979. Feeding habits of the predaceous nymphs of *Dolania americana* in northwestern Florida (Ephemeroptera: Behningiidae). *Hydrobiol.* 67: 119-123.
- Wester, E.E. and G.W. Folkerts. 1987. The mayfly, *Dolania americana* (Ephemeroptera: Behningiidae) in Alabama. *Entomol. News* 98: 253-254.